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ABSTRACT

The effects of intervening synthesis/review sheets, periodic practice worksheets, a combination of review and practice, and an advance organizer on learning from prose text were investigated. Using 161 college students as subjects, the study increasingly added learner activities to an instructional unit (Lamberski's revised edition of the Dwyer heart materials) to determine their effect on achievement. The short unit-introduction statement was replaced with an advance organizer containing general orienting information, educational objectives, and a preview of posttest question types. Initial analysis showed no significant differences among treatment groups, and increased time spent on learning activities did not correspond to increased achievement. A related study providing scores on the same prose/test arrangement without an extended advance organizer and another study identifying problems with the original Dwyer text provided a basis for further analysis. Results suggest that the pre-set that the subjects received with additional information in the advance organizer introduction made a difference in learning and storage of the material for testing. It was concluded that difficult or detailed concept learning may require more planned instructional activity (such as review and practice) than reading a text or viewing a visual. (LMM)

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THE EFFECTS OF REVIEW AND PRACTICE TECHNIQUES ON LEARNING FROM PROSE MATERIAL

by

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IR010 447

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The Effects of Review and Practice Techniques on Learning from Prose Material

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The Problem

The problem under investigation in this study had several aspects:

1. What effect do intervening synthesis/review sheets have on learning from prose text?
2. What effect do periodic practice worksheets have on learning from prose text?
3. What effect do combination of review and practice have on learning from prose text?

A fourth area of concern was the effect of an advance organizer containing general orienting information, educational objectives, and a preview of post-test question types. An initial pilot study text showed no observable differences when the organizer was used, so the text in all five treatments was preceded by the advance organizer introduction.

Related Literature

The basis for developing the treatments for this study was provided by the ideas of Rothkopf (1965) and Gagne (1978) that activities engaged in by the learner at the time of presentation of material influence the outcome of learning.

Rothkopf called these activities the "mathemagenic behaviors" of the learner: the behaviors that produce learning. These "behaviors" included special instruction, questions, cues, and suggestions. This definition of a set of behaviors led to research centering on how the activities can be incorporated into instructional units for the best effect on learning.

Faw and Waller (1976) suggested that rather than call these activities "behaviors," they were more precisely "techniques" employed by the instructor that could have an influence on student learning. They related that research had centered on four techniques in particular:

1. advance organizers (Ausubel, 1960)
2. instructions that put the student in a response mode (taking notes, underlining, etc.)
3. providing objectives
4. presenting inserted questions.

Much of the research in the area of these mathemagenic techniques has centered on the effects of advance organizers (Barnes and Clawson, 1975; Mayer, 1979), and on the effects of questions (Frase, 1967, 1968; Rickards, 1979; Rickards and DiVesta, 1974; Rothkopf and Bisbicos, 1967). Results have been inconsistent. They have varied according to how the experimenter has defined "advance organizer," and how the concept of practice questions was approached: where they were placed, how many were asked, at what frequency they were

placed in the text, whether review was allowed while answering questions, the type of response required, and the length and nature of the prose material they accompanied.

Ellen Gagne re-emphasized the need to look at events at all stages of the learning process with prose material:

1. prior knowledge of content (learner history)
2. before reading (advance organizers, instructions, suggested strategies)
3. during reading (inserted questions, pictures, cues)
4. after reading (review, practice)

This study attempted to add, in a step-like fashion, an increasing amount of these techniques or leraner activities to an instructional unit, to determine what effect they would have on post-test performance. Of particular interest were review activities and practice post-questions.

Procedure

Materials

The learning unit used in this study was Lamberski's revised edition (1980) of the Dwyer heart material (1967)--a 2,000 word prose text with accompanying black and white line drawings on the structure and function of the human heart. Lamberski's text divided the passage into three sections with the sub-headings:

- The Parts of the Heart
- The Circulation of Blood Through the Heart
- The Cycle of Blood Pressure in the Heart.

These logical divisions were used to determine the placement of review and practice activities.

The review pages synthesized material presented in the previous section on one sheet; the review following the nine pages on the parts of the heart was a drawing that showed the twenty parts labeled appropriately with the instructions to view it before continuing. The page following the section describing the flow of the blood through the heart had two diagrams showing the flow plus information that divided the action into "phases"--a term used on the post-test; the final review page also contained two labeled diagrams plus information that detailed the action of the heart in relation to the blood pressure values.

The practice worksheets were single pages inserted after the synthesis/review sheets that gave the learner instructions to answer the questions using either the review sheets or the text before continuing with the unit. This allowed both review and feedback opportunities for the learner. The first worksheet was a matching exercise between the names of the parts of the heart and their descriptions. The second and third pages related to the action of pumping the blood through the heart and were considered to contain questions that aided the students in understanding the "process" of the heart's functioning.

Lamberski's short introductory statement to the unit was replaced by the more detailed advance organizer introduction in all groups.

The criterion measure was performance on a four-part post-test (drawing, identification, terminology, and comprehension) both immediately following the reading of the material and at a two-week delay interval.

Design

The additions to the original prose materials led to the following design, using five treatment groups:

T_1 - Text only

T_2 - Text + three review pages

T_3 - Text + three review pages + "parts" worksheet

T_4 - Text + three review pages + 2 "process" worksheets

T_5 - Text + three review pages + 3 worksheets

The length of time each subject spent interacting with the instructional materials was noted by the experimenter by recording when the text package was distributed and when it was returned for the test materials.

A one-way analysis of variance was performed to determine any significant effects between the treatment groups.

Subjects

The subjects for this study were 161 college students, recruited from several classes at both Penn State University, University Park, Pa. and Marywood College, Scranton, Pa.: Instructional Systems 411, Speech Communications 352, Health Education 303, and Man/Environment Relations. Students participating received some class or laboratory credit for their efforts. All of the classes sampled were general upper-level course offerings with a variety of college majors represented among the students in each class. The testing was done outside of class and required about 1½ - 2 hours participation time from each subject.

Analysis

The initial analysis (ANOVES) showed no significant differences among treatment groups as measured by mean scores on the four criterion tests, either immediately or two weeks after the initial reading.

The one significant effect was found in the amount of time spent on task (p 0.000), with subjects in T1 spending an average of about 21 minutes interacting with the materials, and subjects in T5 interacting for almost 40 minutes with the materials. This suggests that there is a point beyond which it is no longer efficient or effective to continue adding learning activities. Further analysis was undertaken to explore the effects of the treatments and account for the relatively high mean scores, which, while not significantly different over treatments in this study, represent higher scores than usually achieved while interacting with the Dwyer heart unit.

Two previous heart studies provided some basis for further study: Lamberski (1980) and Jennings (1979). The Lamberski study provided scores on the same prose/test arrangement used in this study, but without the extended advance organizer introduction. The Jennings' study identified problem areas in the original Dwyer text that resulted in low achievement (defined as a correct-response rate of less than .600) on each of the four criterion tests. An item analysis was done and compared to the findings of the Jennings' study.

Results

Preliminary findings show that the mean scores across each of the four tests taken immediately after interacting with the unit in this study are (significantly) higher than those in the Lamberskicontrol group.

Direct comparison of results on the delayed retention aspect of the studies was not possible since the interval was two weeks in this study and six weeks in the Lamberski study. However, the mean scores on the two-week delayed retention test in the current study are higher than the immediate post-test scores of the Lamberski study:

	Immediate							
	DR	ID	Term	Comp	DR	ID	Term	Comp
Control	13.05	15.23	12.45	11.91	-	-	-	-
T_1	16.12	17.15	14.67	13.61	14.75	16.57	13.18	14.11
T_2	16.33	16.97	15.03	14.73	14.42	15.65	14.04	13.65
T_3	17.22	18.63	15.91	15.47	15.07	16.72	14.24	14.10
T_4	17.00	18.66	15.63	15.47	15.07	16.86	13.62	14.00
T_5	17.55	18.13	15.58	15.71	15.77	16.77	14.85	15.08

It appears that the orienting information and the preview of the test question types provided in the introduction to the instructional unit in this study did have a significant impact on the way the students approached the task of learning the material.

The item analysis of the test questions that had correct-response rates of less than .600 on the original Dwyer study, according to Jennings, has shown that improvement has occurred across all treatments in this study. The most dramatic increase is seen in the Identification test, which had seven questions with correct-response rates ranging from .197 to .598. In the current study, the correct-response rates ranged from .606 to 1.00 on the same questions. In comparing the improvement across treatments, T3, T4, and T5, those treatments with practice activities as well as review pages, appear to produce higher correct-response rates. Additional analyses of these response rates and trends in the data are currently being undertaken.

Discussion

Results of the study suggest that:

1. The pre-set that the subjects received with the additional information in the advance organizer introduction made a difference in the way the material was learned and stored for testing. Additional research needs to be conducted to find the strength of the effects of each part of that introduction--the general orientation to the subject, the statement of learning outcomes, and the preview of post-test question types.

2. The learning of particulary difficult or detailed concepts (similar to the process of blood circulations through the heart) may need more planned instructional activity than reading a text and viewing a visual. Review plus practice questions can provide this activity and prepare students for more difficult questions.

3. The high mean scores that were similar across all treatments may be indicative of a need to re-examine the test questions used with this unit. There may not be enough items in the current post-test that challenge a sufficient range of knowledge; i.e., the treatments with more activity required may have prepared the students to answer questions of a more detailed and difficult nature than were provided in the twenty item tests.

4. The significantly greater amounts of time spent on the treatments with more activities without a corresponding increase in achievement suggests that the amount of activity planned into an instructional unit should be appropriate to the amount of emphasis the unit has within the curriuclum, and to the nature of the expected learning outcome.

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